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12. **Proposed by H. W. DRAUGHON, Clinton, Louisiana.**

Find three numbers such that, the sum of their cubes may be a square, and the sum of their squares a cube.

Solution by ARTEMAS MARTIN, LL.D., U. S. Coast and Geodetic Survey Office, Washington, D. C.

Let ax, bx and cx denote the numbers; then $(a^3+b^3+c^3)x^3=\square\ldots.(1)$, $(a^2+b^2+c^2)x^2=\text{cube},=x^3$ say....(2) and we have $x=a^2+b^2+c^2$.

Substituting in (1), after expunging x^2, $(a^2+b^2+c^2)(a^3+b^3+c^3)=\square\ldots.(3)$.

Let $mv=a$, $nv=b$, $pv=c$; then (3) becomes

$$(m^2+n^2+p^2)(m^3+n^3+p^3)v=\square,=v^2 \text{ say, after rejecting } v^4\text{; whence}$$

$$v=(m^2+n^2+p^2)(m^3+n^3+p^3).$$

$$\therefore\quad a=m(m^2+n^2+p^2)(m^3+n^3+p^3),$$

$$b=n(m^2+n^2+p^2)(m^3+n^3+p^3),$$

$$c=p(m^2+n^2+p^2)(m^3+n^3+p^3);$$

$$\text{and } x=a^2+b^2+c^2=(m^2+n^2+p^2)^3(m^3+n^3+p^3)^2.$$

$$\text{Hence } ax=m(m^2+n^2+p^2)^4(m^3+n^3+p^3)^3,$$

$$bx=n(m^2+n^2+p^2)^4(m^3+n^3+p^3)^3,$$

$$cx=p(m^2+n^2+p^2)^4(m^3+n^3+p^3)^3.$$

If $m=1$, $n=2$, $p=3$, the numbers are, after dividing out the 6th power factor 6^6, 38416, 76832 and 115248.

Also solved by *H. W. DRAUGHON, F. P. MATZ, and G. B. M. ZERR.*

PROBLEMS.

18. **Proposed by Professor G. B. M. ZERR, A. M., Principal of Schools, Staunton, Virginia.**

Decompose into the sum of two squares the number $17^3.73^5$.

19. **Proposed by ARTEMAS MARTIN, LL. D., U. S. Coast and Geodetic Survey Office, Washington, D. C.**

Find three positive integer numbers whose sum is a cube, and, also, the sum of any two diminished by the third a cube.

AVERAGE AND PROBABILITY.

Conducted by B. F. FINKEL, Kidder, Mo. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

5. **Proposed by DE VOLSON WOOD, M. A., C. E., Professor of Mechanical Engineering, Stevens Institute of Technology, Hoboken, New Jersey.**

An actual case suggested the following:

An equal number of white and black balls of equal size are thrown into a rec-